11: India G-4, 5 (1960-1961) 1962. AW11 Kerala AW11

6.10 The present method of working these sands is haphazard and extremely short-sighted. The dunes are getting exhausted while the washings are dependent on a good monsoon. A better method would be to work the sand bar itself. This would also be in the interests of (*i*) conservation and (*ii*) ensuring a regular supply of raw sand independent of the vagaries of nature. Even if working of the sand bar suggested above is not taken up now, back filling of pools with sand tailings from mineral sand companies would prove beneficial. It would lead to building up of sand rich in heavy minerals, other than ilmenite. At present the tailings which contain 80 per cent of the original rutile and all the sillimanite and zircon, are dumped into the sea.

6.11 The extraction of ilmenite is done by the mineral sand companies at Chavara. Till recently there were four units, namely, two units belonging to the Travancore Minerals, one to F.X. Pereira Minerals and one to Hopkins and Williams. These concerns were all under private ownership till 1945. Realizing the strategic importance of these sands, the Travancore State assumed control of the sand deposits during that year ; and the mineral concerns continued to work as agents on behalf of the State. A few years later, however, the Travancore Minerals (1951) and F.X. Pereira Minerals (1956) were taken over by the State Government and run directly as State enterprises.

6.12 Hopkins and Williams, however, continued in private hands till 1959. By this time some difficulties cropped up with labour. The firm had also accumulated vast arrears of royalty to the tune of Rs. 28 lakhs. At this stage the management decided to close down the unit. In the interim period their export contracts had also lapsed. As a result of all these developments, there are two mineral concerns at present operating three units, whose total capacity is 1,60,000 tons. In view of the reduced foreign demand for Indian ilmenite, closure of Hopkins and Williams has not created any serious problem.

6.13 The output per man per shift works out to 0.41 ton at the Travancore Minerals Plant and 0.40 ton in the F.X. Pereira unit ; whereas in the Hopkins and Williams plant, now closed, the output per man per shift was around one ton. This was partly due to a better layout of the machine. In the existing plants much effort and material is lost in transportation from one unit to another. In addition, excessive labour appears to be employed in the plant of the Travancore Minerals (P) Ltd.

6.14 The production of ilmenite rose from 216,000 tons in 1950, to a peak of 314,000 tons in 1956. Since then it has been fairly steady between 270,000 and 290,000 tons. The value has also been going up from Rs. 33 lakhs in 1950 to Rs. 170 lakhs in 1959. The present price is Rs. 60 per ton.

6.15 Ilmenite is mainly used in the manufacture of TiO_2 (titanium) white pigment. TiO_2 is used in various other industries like paper, delustrant in rayons, rubber compositions, plastics, printing inks, cosmetics, etc. Titanium metal is not widely used mainly because of its high cost of production.

6.16 Only a very small portion of the production of ilmenite is consumed within the State in the manufacture of TiO_2. The Travancore Titanium Products Ltd., Trivandrum, utilize about 3,000 tons of this mineral. This plant is expanding its capacity to 10 tons a day by 1961, and will then require 6,000 tons of ilmenite. The

rest of the production is exported to various countries, the bulk of it going to the USA and the UK. Export figures are given in Table 29 for the period 1956–59.

6.17 Irregular supplies made through the Koilthottam port, mainly due to labour difficulties, have resulted in the loss of contracts with importers in the USA. Export possibilities of ilmenite are now limited only to two contracts to UK totalling 1,50,000 tons per year. This setback has occurred in spite of the fact that the Chavara ilmenite has a high TiO_2 content (55-60%) and is cheaper when compared to Malayan ilmenite (about 45% TiO_2) which, however, finds a ready export market.

6.18 India, which at one time used to hold almost a monopolistic position in the export of ilmenite has now to face competition. Side by side with the expansion of titanium industry, other world sources for supply of ilmenite have come into operation as in Norway, Canada, Malaya, Australia, South Africa, etc. Whereas in 1940 India used to contribute 90 per cent to world production of ilmenite, now its share is only 25 per cent.

6.19 In view of the rapid expansion of India's steel industry, the consumption of TiO_2 pigment is itself expected to go up. The total requirements of ilmenite by 1965-66 would be 150,000 tons a year for export and 36,000 tons a year for the manufacture of TiO_2 pigment, on the basis of proposal for expansion of Titanium Dioxide plant at Trivandrum incorporated in this report. Table 30 gives demand for Titanium Dioxide pigment from steel industry and various other sources. The two existing companies can produce about 160,000 tons a year. Extra capacity of 30,000 tons a year will have to be installed, and this along with certain improvements suggested earlier may require an investment of Rs. 20 lakhs. Very little increase in labour force is envisaged. The existing labour force itself appears to be excessive, since the output per man per shift works out to a low level of 0.4 tons.

6.20 During the Fourth Plan period, steel production is expected to double itself. Therefore, by 1970-71, the demand for Titanium Dioxide may also be expected to be roughly double of the demand in 1965-66. This would necessitate another 30,000 tons of ilmenite per annum. Total requirement of ilmenite by 1970-71 would thus be 220,000 tons a year, comprising of 150,000 tons for export and 60,000 tons for the manufacture of Titanium Dioxide. This would involve further additional outlay of Rs. 10 lakhs. Even this order of expansion can be achieved with the existing labour at an output of one ton per man per shift which would measure a fairly reasonable level of productivity.

Monazite

6.21 Monazite is a phosphate of thorium and cerium with rare earth elements and small quantities of Uranium Oxide. It constitutes a source of the radio-active element, thorium being used for atomic energy purposes. Monazite was first discovered in India, by C.W. Von Sohomberg, a German citizen, in 1909 along the beach at Manavalakkurichi.

6.22 Monazite occurs along with other heavy minerals in the beach sands. Reserves of the order of 6.7 million tons are estimated to be present in the bar between Neendakara and Kayarkulam. There is, however, no production of monazite

[Table 30, appearing on p. 290 of the text, has not been processed -- Analyst]

11: India G-4, 5 (1960-1961) 1962 AWll Kerala AWll

concentrates from Chavara, the Manavalakkurichi (in Madras State) material being preferred because of its higher thorium content.

6.23 A rare earth factory is located in the State at Alwaye, which processes 1,500 tons of monazite a year ; but it obtains its requirements from Manavalakkurichi in the Madras State. This factory produces Thorium Oxide, rare earth salts and Trisodium Phosphate. The Chavara Monazite may be considered for use in the rare earth factory instead of the monazite from Manavalakkurichi in Madras State, particularly in view of the fact that monazite would be a byproduct of ilmenite which is won in larger quantities in Kerala and may, therefore, prove cheaper.

Rutile

6.24 Rutile is another titanium mineral occurring in smaller quantities in the beach sands. The beach washings contain, on an average, about 4 per cent of rutile. A portion of the sand bar at Neendakara is estimated to contain 740,125 tons of the mineral.[1] Kerala is the only State in India producing rutile.

6.25 At present only one of the mineral sand factory units produces this mineral. Electro-static separators are used in concentrating rutile from the non-magnetic tailings after the extraction of ilmenite. Recovery is one-fifth of the rutile content of raw sand and the rest is allowed to go into the tailings for lack of equipment.

6.26 Only small quantities of rutile are produced. During 1959, 482 tons valued at Rs. 4.75 lakhs were beneficiated. The current price is Rs. 1,000 a ton. The mineral is not utilized in the State, but is sent to Bombay and Calcutta for the manufacture of welding rods. During 1957, 155 tons of rutile were imported to meet the requirements of this industry. Future requirements of welding rods within India is estimated to go up from 417 m. ft. in 1960-61 to 2,022 m. ft. in 1970-71.[2] To meet this rise in demand, output of rutile would have to be stepped upto 6,750 tons by 1970-71. An expansion in capacity of this order would require an investment of the order of Rs. 10 lakhs.

Sillimanite and Zircon

6.27 Sillimanite as well as zircon occur in small amounts in beach sands in association with ilmenite and other heavy minerals. They average 5.9 per cent and 4.2 per cent respectively of the beach washings. In addition, 1,916,260 tons of sillimanite and 799,350 tons of zircon are estimated to form a part of the Neendakara bar.[3] Only experimental production of either of these minerals has been taken up so far.

6.28 Sillimanite is mainly used in refractories, but the internal requirement of sillimanite refractories is very small. Moreover, the material from Assam which is of a massive variety can be shaped into blocks and used directly. Export possibilities are also dim and due to the development of artificial mulite bricks from domestic kyanite in the USA. Exports have dropped from 20,000 tons to 6,000 tons in 1957.

[1] *Peaceful Uses of Atomic Energy*, Proceedings of the Second International Conference, P. 102.
[2] NCAER estimates.
[3] *Peaceful Uses of Atomic Energy*, Op. Cit, p. 102.

11: India G-4, 5 (1960-1961) 1962 AW11 Kerala AW11

the cost of generation as estimated at present would rarely exceed 2 nP per unit. As against this, the cost per unit of thermal power is estimated to vary between 6 nP to 10 nP for stations which are far from coal fields, as would be the case if Kerala were to go in for thermal generation. Table 35[2] presents some factual data regarding the cost of hydro-power generation.

7.20 Development of thermal power resources sometimes becomes necessary as a stabilizer for fluctuations in generating capacity of hydro dams caused by variations in the extent of rainfall. This problem does not arise in case of Kerala since a high level of rainfall which, in addition, is fairly well distributed over the year, is practically assured. As pointed out in another chapter, the co-efficient of mean deviation for annual rainfall in the case of Kerala is one of the lowest in the whole of India.

7.21 On account of these factors, electric energy from hydro resources would continue to occupy a predominant place in Kerala. The possibility of generating nuclear power within the foreseeable future can almost be ruled out for Kerala. Investment in nuclear power stations is of the order of Rs. 1,800 to Rs. 2,500 per kW of installed capacity, which is higher than those for thermal and hydro stations. Since Kerala has plenty of untapped hydro-power potential, the question of using nuclear energy does not arise.

DEMAND FOR AND SUPPLY OF POWER

7.22 The simultaneous maximum demand, as recorded on the State electricity system, reached a peak of 94 MW during September, 1960. Over and above this, purchase from Madras State for Kerala system was about 8.6 MW and from Kerala to Madras was about 2.6 MW. So the net draw from the Madras system during September, 1960, was of the order of 6 MW. Hence the latest recorded demand on the State may be taken to be of the order of 100 MW during Sepember, 1960, as against the available firm capacity of 84.5 MW.

7.23 In this context, an independent forecast may be attempted here on the basis of projections for industrial output made in the chapter on Industries. Factory sector is the main industrial consumer of electricity accounting for roughly 65 per cent of energy generated. The net output of factory industry is projected to increase from Rs. 24.4 crores in 1960-61 to Rs. 89.2 crores in 1970-71. In 1955-56, power consumption by industries corresponding to net factory output of Rs. 18.40 crores was 224 million kWh. In other words 1.24 units of electricity were used to produce one rupee worth of net output in industries. The corresponding ratio for the country was 0.8 kWh/Rupee. The relatively higher coefficient in Kerala reflects the more power-intensive industrial structure. This is mainly due to the location of aluminium and other electro-chemical industries in Kerala.

7.24 According to NCAER's projections[1], the power intensity of industries may be expected to increase both as a result of the spread of power-using equipment and

[1] *Demand for Energy in India* (1960—75), NCAER.

[2] [Table 35, appearing on p. 293 of the text, has not been processed. – Analyst]